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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/789,777	02/27/2004	Hung-Chin Guthrie	HIT1P057/HSJ920030250US1	1914

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EXAMINER	
TUGBANG, ANTHONY D	
ART UNIT	**PAPER NUMBER**
3729	

DATE MAILED: 11/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/789,777	GUTHRIE ET AL.	
	Examiner	Art Unit	
	A. Dexter Tugbang	3729	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) *1-5,7 and 9-18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6 and 8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/27/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of the invention of Group II, Claims 6 through 16 in the reply filed on September 21, 2006 is acknowledged. It is noted that within this response, however, the applicant(s) did not elect any of the species within Group II (as noted in paragraph 6 of the last Office Action, Restriction Requirement mailed on August 21, 2006).

2. During a telephone conversation with Mr. Ronald B. Fleece on October 31, 2006, a provisional election was made without traverse to prosecute the invention of Group II, Species B, Claim 8. Affirmation of this election must be made by applicant in replying to this Office action.

Claims 1 through 5, 7, and 9 through 18 have been withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claims 6 and 8 are pending for examination.

Claim Objections

3. Claim 6 is objected to because of the following informalities: the term "Amonium" (line 12) appears to be misspelled and should be recited as –Ammonium--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

5. Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In Claim 8, it is unclear what is meant by the phrase of "substantially the same rate" (line 3). Does this mean that within the CMP process, that the exact same value rate is applied to the removal of each of the photoresist, hard mask, Ta and Cu? Or if the value of the removal rate is slightly different for each of the photoresist, hard mask, Ta, or Cu, to what degree can the removal rate vary and say have different rates so that they can all be said to be at "substantially the same rate"? Having different values of removal rates for each of the photoresist, hard mask, Ta and Cu, would mean that each would have different rates and this completely contradicts that they would all have "substantially the same rate", which renders the claim as being vague, indefinite, misleading and confusing.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant(s) Admitted Prior Art, referred to hereinafter as the AAPA, in view of Mueller et al 6,435,947 and Kaufman et al 5,954,997.

The AAPA (specification, pages 1-7, Prior Art Figures 1-7) discloses a method for forming a Cu coil for use in a magnetic head comprising: forming a magnetic pole structure (e.g. 405); depositing a photoresist (e.g. 404 or 410); depositing a hard mask (e.g. 406); patterning the hard mask to define a coil pattern through the use of the photoresist (e.g. 410); performing a material removal process (e.g. deep reactive ion etch) to form at least one trench (e.g. channels 412) according to the coil pattern; depositing Ta (e.g. 502); depositing Cu (e.g. 504); and performing a chemical mechanical polishing (CMP) process to remove material from the photoresist, the hard mask, Ta, and Cu (see sequence of Prior Art Figures 6 to 7).

The AAPA teaches substantially all of the limitations of the claimed manufacturing process except that the CMP process includes a slurry comprising at least: Ammonium Persulfate, Benzotriazole (BTA), and SiO_2.

Both Kaufman and Mueller disclose that it is known within CMP processes to use a slurry that includes various components to planarize, etch, or remove metal materials and dielectric materials.

Kaufman teaches that a slurry in a CMP process that removes material of copper and other dielectric materials has at least three components: 1) a film forming agent of *benzotriazole* (col. 5, lines 44-65); 2) an abrasive of silica, i.e. SiO_2 (col. 7, lines 1+); and 3) and an oxidizer of *ammonium persulfate* (col. 9, lines 45-60). The purpose of having at least these three components within the slurry provides at least one advantage of providing desirable polishing rates between metal layers and the dielectric insulating layers (col. 8, lines 35-43).

Mueller teaches the very same three components of a slurry within a CMP process as Kaufman. Mueller suggests another advantage of having these three components in the slurry,

which is that these components altogether make a slurry composition that provides tailored effective polishing rates of metal layers (e.g. copper) that minimizes surface imperfections, defects, corrosion and erosion, while offering polishing selectivities to other thin-film materials (col. 2, lines 15-27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of the AAPA by including the specific three components of a slurry with the CMP process, as taught by Kaufman and Mueller, for the purpose of removing material from the metal layers (e.g. Cu, Ta) and other dielectric layers (e.g. photoresist, hard mask), as Mueller and Kaufman each have their own associated advantages.

8. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of the AAPA, Mueller et al, and Kaufman et al as applied to claim 6 above, and further in view of IBM Technical Disclosure Bulletin dated October 1994, referred to hereinafter as IBM.

The AAPA, as modified by Mueller and Kaufman, disclose the claimed manufacturing process as relied upon above in Claim 6. The modified AAPA method does not mention adjusting a ratio of ammonium persulfate and benzotriazole to achieve removal at substantially the same rate.

IBM suggests adjusting a ratio of ammonium persulfate and benzotriazole by adjusting or adding the quantity of benzotriazole to effectively provide one etch rate ratio for the metal layers and another etch rate ratio for the dielectric insulator layers. As best understood, the etch rate ratios for each of the layers can be said to be at "*substantially* the same rate" to the extent that the term substantially does not specify to what degree the values of etch rates should be for each of the photoresist, hard mask, Ta and Cu. So removal rates for the photoresist, hard mask, Ta and

Cu can each have different values of removal, or etch rates, yet still be at "substantially the same rate".

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of the AAPA by adjusting the ratio of ammonium persulfate and benzotriazole, as taught by IBM, to provide etch/removal rates of the photoresist, hard mask, Ta and Cu at substantially the same rate and to ultimately achieve and an end point of the CMP process.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to A. Dexter Tugbang whose telephone number is 571-272-4570. The examiner can normally be reached on Monday - Friday 7:30 am - 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Vo can be reached on 571-272-4690. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A. Dexter Tugbang
Primary Examiner
Art Unit 3729

November 2, 2006